

Fluid Resuscitation in Septic Shock: An Exploration of Emergency Department and Critical Care Clinician Perceptions and Decision-Making

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Introduction

Sepsis is a leading cause of in-hospital morbidity and mortality and the most expensive condition treated in US hospitals.^{1,2} For patients who progress to septic shock, in-hospital mortality can be as high as 40-80%.³ Timely recognition and treatment of sepsis, including early intravenous (IV) fluid resuscitation and administration of antibiotics, improves patient outcomes.^{1,4,5,6} The 2016 Surviving Sepsis Campaign (SSC) guidelines specifically address fluid resuscitation as an essential element of care with a three-hour window for initial fluid delivery.^{7,8} However, data have been inconclusive regarding the acceptability of this time frame to reach necessary clinical parameters, and controversy remains.

No studies have been conducted to date to understand the decision-making process for IV fluid resuscitation for septic and septic shock patients in the emergency department. This study sought to capture the perceptions, influences and nuances of this process and how they impact approaches to clinical care.

Methods

In 2017 and 2018, a total of twenty-five (25) interviews were conducted with physicians, nurse practitioners, and clinical nurses who regularly treat patients with sepsis in the emergency department or in a critical care unit. The in-depth, probing interviews included physicians (n=17), nurse practitioners (n=3), and clinical nurses (n=5) across 11 hospitals in ten states (Arizona, California, Colorado, Florida, Illinois, Indiana, Iowa, New Hampshire, Oregon, and South Carolina). Seventeen of the clinicians were medical providers (physicians or nurse practitioners) who worked in the emergency department, three worked in critical care, two were trauma surgeons (one of the trauma surgeons was also a critical care physician) and four were clinical (staff) nurses who worked either in the emergency department or an intensive care unit. Semi-structured interview guides included questions developed to assess perceptions

of sepsis and decision-making about fluid resuscitation. The study protocol and materials were approved by the Stevenson University Institutional Review Board.

Results

Decision-Making Related to Fluid Resuscitation for Septic Shock

Nineteen participants (76%) reported that if a septic shock patient presented with no conditions that could be exacerbated by excess fluids, their preference would be to administer an initial fluid bolus immediately. In fact, many participants reported administration of one or more smaller boluses of fluids within 30 minutes as an important part of their standard practice. One participant said:

"I find it best to give small, measured boluses of fluid until they're improving. This small but accurate amount lets me see their reaction, and I know I'm on the right track."

Interestingly, some participants reported that they frequently used the administration of a fluid bolus as a diagnostic tool, enabling them to eliminate common ailments which often bring patients to the ED. One physician noted:

"Fluids are integral to the first step of treatment and diagnosis. They also can help get to the 'real' diagnosis quicker."

While all participants agreed that early resuscitation would be ideal for the majority of septic shock patients, participants struggled to articulate their decision-making process regarding specific timing and volume of fluid resuscitation. Generally, participants reported they paid close attention to the immediate physical signs and vitals of their patients.

"If someone comes in and they don't look well and they're hypotensive, I think one of the first things I'll do is give them a fluid challenge to see if they'll respond to it."

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How Providers Incorporate Fluid Resuscitation and Related Guidelines into Diagnosis and Treatment Plans

Some participants were able to recall specific fluid resuscitation guidelines, but the majority use previous knowledge and experiences combined with bedside observations to guide fluid therapy for a specific patient. In fact, the empirical response to the initial fluid bolus was an important indicator for some providers. As one participant stated:

"I just give them a fluid challenge of a bolus and see how they do. In that moment... you can just kind of always tell, it's a gut thing and by looking at them. I'm sure there are guidelines where that came from; it's just something I've always done."

100% of study participants indicated that early fluid resuscitation was key in the treatment of septic shock. All had also observed a positive correlation with patient outcomes and early, rapid fluid in their practice.

All 25 (100%) participants supported the importance of early fluid resuscitation in septic shock. Consistently, participants expressed their experience with observing improvements in patient outcomes associated with early and rapid fluid resuscitation.

"Fluids are key. You have to sort of give them as much intravascular fluids as you can. I think antibiotics are key too – but you've got to establish a good medium to do that through so good fluid volume in the body first is important."

When asked about the potential cost benefits of early, rapid fluids for patients in septic shock, fifteen participants (60%) indicated that early rapid fluid delivery would reduce costs incurred by their department more than any other intervention. Given the perceived importance of fluid resuscitation, 12 of the 17 physicians reported micromanaging fluid resuscitation to ensure their patients were receiving fluids prior to any other interventions.

See Table 1 for additional participant statements on the importance of early fluid boluses in septic shock.

Given recent debate around fluid responsiveness and the concern of fluid overload,^{9,10,11} participants were asked about their understanding of when to stop fluid administration and how concerns about fluid overload influence their approach. Although participants recognized that excess fluid can be harmful, most participants believed that the benefits of an early fluid bolus in septic shock patients outweigh the risks.

"The literature shows that fluids cause more help than harm in a big way."

"For me, the risk is so minimal for early and fast fluids initially. There is nothing worse than having a patient go septic on you ...and wishing you could have gone back. In those cases, who knows – the fluids really could have made a difference for the long-term outcomes."

Generally, participants exhibited less clarity around how they decide to stop administering fluids in septic shock patients. Most reported that they "...stop giving fluids when the patient gets better or gets worse". Specific thresholds for the discontinuation of fluids were not at the forefront of the decision-making process for participants, unless the patient had specific pre-existing condition such as chronic renal failure. One physician noted:

"The likelihood that someone who is not in acute renal or heart failure would die without you noticing from administering fluids is so low. The costs outweigh the benefits, and I think I have done harm in the past by not giving fluids as quickly as I do now."

Many participants reported they had learned the benefits of fluids through time and experience, stating that they wished they had approached fluid resuscitation with less hesitancy earlier in their careers.

This sentiment was shared by 18 physicians and 2 nurses (80% of the total sample). See Table 1 for additional participant statements on fluid overload and stopping fluid resuscitation.

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Table 1. Additional illustrative quotations.

Domain	Illustrative Quotation
Importance of fluid resuscitation in septic shock	<p><i>"In every case that I see septic shock that has a good outcome – I can trace that outcome back to administering early fluids."</i></p> <p><i>"My mantra is – fluids! The earlier and quicker the better for all!"</i></p> <p><i>"Our docs do push early fluids. Kind of like the earlier the quicker the better for everyone involved."</i></p> <p><i>"Fluids can be so helpful and instrumental in patient care that sometimes they go unnoticed – like the unsung hero."</i></p>
Fluid resuscitation methodology in septic shock	<p><i>"It really depends on how the patient looks, how much they can take; the amount can vary patient to patient."</i></p> <p><i>"If you do exactly what the guidelines say and calculate the fluids by patient weight – it spits out a weird number and we just don't have fluid bags that are like, you know, 44cc. So, I just use what I call general guidelines – 1 liter of fluid in 30 minutes which I think is pretty standard."</i></p> <p><i>"Yes, administering early quick fluids is always the first step to healing a patient. It's that bridge that takes you from just diagnosing to treating... I can say that in 98% of my patients, the key to their successful outcomes has been fluids - and early ones."</i></p>
Fluid overload and when to stop fluid resuscitation	<p><i>"I was always sort of taught initially that you should be careful of over-resuscitating someone with fluids, you know if they have cardiogenic shock or heart failure...I think as I've practiced I've realized that I've made more mistakes in under resuscitating people because I was afraid that I would give them too much fluid."</i></p> <p><i>"A significant amount of training is [involved] behind when to start fluids, but there's not a whole lot I can really recall in my training of when to stop unless it is obviously harmful."</i></p> <p><i>"I can remember times when I wish I would have given a bolus or two much earlier to the patient and if I had, I don't know, you know – maybe they would have been discharged instead of being sent to the ICU."</i></p>

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Discussion

Although sepsis alerts and treatment protocols have been widely adopted by hospitals, sepsis outcomes remain variable.^{12, 13} It is unclear why this is the case, but over the past several years there has been significant discussion regarding the potential harmful effects of excess fluids.^{14, 15} These concerns stem from studies demonstrating that fluid accumulation over the entire course of stay can lead to worse outcomes in sepsis patients.^{16, 17} It is important to distinguish between fluids aimed at resuscitation and fluids provided beyond the emergent timeframe. Early fluid resuscitation targeted at the reversal of shock and hypotension has repeatedly demonstrated improvement in patient outcomes in adult septic shock.^{7, 18, 19, 22} Despite the current controversy, all participants in this study demonstrated knowledge of the importance of early fluid resuscitation in septic shock patients and many shared observations of improved patient outcomes when administered as part of acute care.

Participant responses were consistent with a significant volume of literature showing that reversal of shock is most successful in the early hours of diagnosis and critical to avoid further morbidity and mortality.^{14, 22, 23} Marchick, et al. demonstrated that even a single episode of non-sustained hypotension resulted in 3 times the risk for mortality for patients with septic shock.²⁰ A recent study of over 8700 patients by Maheshwari and colleagues observed a stepwise increase in risk of acute kidney injury and mortality among patients with septic shock as average mean arterial pressure (MAP) decreased below thresholds of 85, 75, 65, and 55 mmHg.²¹ And finally, Leisman, et al have shown that two-thirds

of sepsis patients with hypotension are responsive to an initial fluid bolus, and that initiation of fluid resuscitation in the first 30 minutes was associated with lower mortality and shorter ICU length of stay.^{14, 22} Even short delays in bundle initiation negatively impact outcomes.²³

Implications for Emergency Nurses

Regardless of the specific sepsis guidelines or “bundles” used to treat patients with sepsis, the assessment of the patient’s response to the administration of a fluid bolus may be used as a diagnostic tool and is critical in helping to guide additional care. Emergency nurses can help improve sepsis outcomes by being aware of national sepsis guidelines or bundles used by their institution, collaborating with providers to deliver evidence-based care to these patients, and promptly reassessing patients’ responses to every fluid bolus delivered as part of this care.

Conclusion

A frequent criticism of the recent SSC-proposed Hour-1 bundle is the lack of strong evidence supporting the new proposed guidelines and the subsequent concern that clinicians will strictly follow a “one-size-fits-all” approach without exercising clinical judgment. The results from this study challenge this concern. Participants shared experiences that support the use of early fluid resuscitation in septic shock patients and that clinicians appear to rely as much or more on their judgment and experience than protocols and guidelines for determining when and how to administer fluids.

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